DOCUMENT RESUME

ED 238 921 TM 840 011

TITLE Student Achievement in Illinois, 1970 and 1981.
INSTITUTION Illinois State Board of Education, Springfield.
PUB DATE Sep 83
NOTE 21p.
PUB TYPE Reports - Evaluative/Feasibility (142)

EDRS PRICE MF01/PC01 Plus Postage.
DESCRIPTORS *Academic Achievement; Academic Records; Achievement Tests; Comparative Testing; English; Grade 11; High Schools; *Longitudinal Studies; Mathematics; Questionnaires; Sciences; Social Studies; *State Programs; *Student Characteristics
IDENTIFIERS *Decade Study Test; *Illinois

ABSTRACT

This report summarizes the results of a study of the achievement of Illinois high school juniors in 1970 and 1981. The purposes were to provide a comparison of student performance over a period of time and to identify educational, social, and personal conditions that relate to performance on a test of Natural Science, Social Studies, English and Mathematics. Data were collected through the Decade Study Test; school records; and a set of information about students, their families and home environments, and their schools, obtained from questionnaires included in the 1981 administration of the battery. The results of the Decade Study indicate that performance of high school juniors was significantly lower in 1981 than it was in 1970. The school variables that most critically affected achievement were enrollment and dropout rate. Three aspects of family life were also strongly related to achievement in 1981: father's education, mother's education, and talking to parents about school. In terms of motivation, three features were strongly related to 1981 student performance: the students' estimate of success on the Mathematics subtests, the number of mathematics courses taken by students, and students' belief in their own abilities and efforts to perform well in school. (PN)

****
* Reproductions supplied by EDRS are the best that can be made *
* from the original document. *
****

ED238921

Student Achievement in Illinois, 1970 and 1981

U.S. DEPARTMENT OF EDUCATION
NATIONAL INSTITUTE OF EDUCATION
EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)

☒ This document has been reproduced as received from the person or organization originating it.

☐ Minor changes have been made to improve reproduction quality.

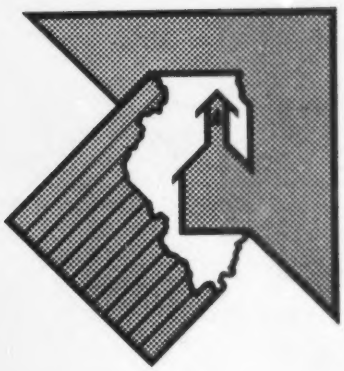
• Points of view or opinions stated in this document do not necessarily represent official NIE position or policy.

"PERMISSION TO REPRODUCE THIS MATERIAL HAS BEEN GRANTED BY

M. Nicholas

TO THE EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)."

TM 840 011



EDUCATION IS EVERYONE'S FUTURE

Student Achievement in Illinois, 1970 and 1981

ILLINOIS STATE BOARD OF EDUCATION
SEPTEMBER 1983

Contents

Foreword iv

OVERVIEW 1
STUDENT PERFORMANCE 2
ABILITY AND PERFORMANCE 2
SCHOOL CHARACTERISTICS AND PERFORMANCE 3
STUDENT CHARACTERISTICS AND PERFORMANCE 3
EFFECTS OF ENVIRONMENT AND MOTIVATION 4
DISCUSSION 4

Appendices

A — The Decade Study Test 7
B — Design and Analysis 11
C — The Prospects of Comparative Studies at Local Educational Agencies 13
D — Historical Context 15

Foreword

In June 1980, the Illinois State Board of Education initiated a plan for a Decade Study to compare the academic performance of Illinois high school juniors in 1981 with that from 1970. In addition to collecting data on academic achievement, the plan called for other types of information about students and their environments. The purposes of the study were (1) to compare performance on a test of Natural Science, Social Studies, English, and Mathematics in 1981 to performance in 1970, and (2) to identify the characteristics of student, home, or school related to the results.

The baseline test information from 1970 was made available to the state agency by the Center for Instructional Research and Curriculum Evaluation (CIRCE) at the University of Illinois, Urbana-Champaign. Comparative information about student performance in 1981 was obtained through testing a random sample of the same schools that participated in 1970.

The implementation of this study required the cooperation and effort of many people, including principals, teachers, counselors, and students. The support of Thomas Hastings at CIRCE allowed the project to get its start. Permission to use the test was granted by Educational Testing Service (ETS) in Princeton, New Jersey, where Jack Moe was of great assistance. At the University of Florida, Robert Feinberg provided assistance in obtaining information about the development of the test and its use in Florida. At the Illinois State Board of Education, conceptualization, design, and implementation of the study were undertaken primarily by Norman Stenzel and Leslie J. Fyans, Jr. In addition, an advisory committee consisting of Thomas Hastings, Robert Linn, and Delwyn Harnish of the University of Illinois, and Roger Farr of Indiana University provided guidance in the planning stage of the project. This study would have been impossible without the energy of these and many others.

Overview

This report on student achievement in schools is intended to provide information to the Illinois State Board of Education and school district staff in Illinois. The report summarizes the results of a study of the achievement of Illinois high school juniors in 1970 and 1981. The purposes of the study were to provide a comparison of student performance over a period of time and to identify educational, social, and personal conditions that relate to performance. In these respects, the study was intended to add a new dimension to information about the current condition of education in the state.

Achievement was measured by a battery of tests originally designed as a college entrance examination by Educational Testing Service of Princeton, New Jersey. The battery included subtests on English, Mathematics, Social Studies, and Natural Science. In order to ensure the comparability of information, testing in 1981 was conducted in a manner similar to that for 1970. Students in 1981 were tested in a sample of 122 of the 307 public schools where testing took place in 1970, when the test was offered as a service by the Center for Instructional Research and Curriculum Evaluation at the University of Illinois, Urbana-Champaign. The number of student records used in the analysis was 11,466 in 1972 and 9,643 in 1981.

Additional information to help explain test results was gathered for the study in a number of ways. Information about the schools and their settings for each of the times represented in the study was taken from the records of the Illinois State Board of Education. Another set of information about students, their families and home environments, and their schools was obtained from questionnaires included in the 1981 administration of the battery.

One of the difficulties of a comparative study of this sort is that important information is not often available from the past because it was not systematically collected then. This is a limitation of this study. Although the study cannot pinpoint all of the conditions contributing to differences from one set of results to another, it does strongly suggest that some characteristics of students, their homes, and schools are more likely to influence academic performance than others.

The major findings of this study are:

1. Academic performance of students in Mathematics, English, Social Studies, and Natural Science as measured by the ETS battery is significantly lower now than it was 11 years ago.

2. The decline in performance occurs for students of all ability levels. This is true even for the top 5% of students, except for performance on one Mathematics subtest.

3. The average level of achievement in most schools was essentially unchanged from 1970 to 1981 relative to the rest of the schools in the sample; significant improvement occurred in 22 schools while 18 declined significantly on one or more subtests.

4. School characteristics such as enrollment, dropout rate, student-to-teacher ratio and per-pupil expenditure did not account for a significant proportion of the differences in performance between 1970 and 1981.

5. Between 40% and 50% of the differences in performance on the subtests in 1981 can be explained by a combination of the effects of schools, families, and student motivation. Most important of the specific conditions

used as part of these general categories are: the frequency of talking to parents about schoolwork, the educational level of parents, student self-appraisal of mathematics performance, and number of mathematics courses taken.

The remainder of the report focuses on the issues best reviewed with the information gathered and analyzed in this study. The appendices describe the test, the study and the analyses conducted, and the prospects for comparative studies at the local level.

Student performance

Student performance on the Decade Study battery was significantly lower on all of the subtests in 1981 as compared to 1970. Declines are most pronounced for both of the English subtests and least pronounced for one of the Mathematics subtests. (See Exhibit 1. A complete table of raw score results is in Appendix A.)

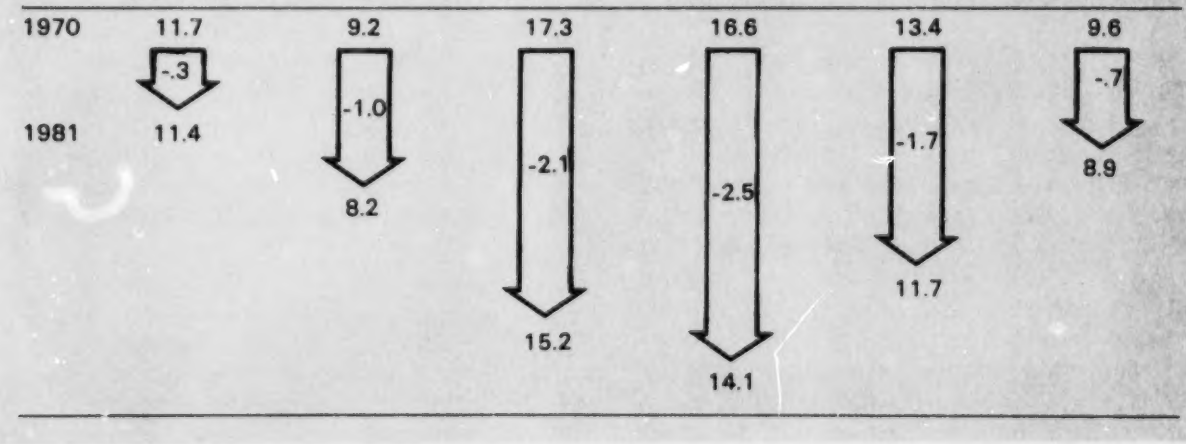
For each of the subtests, the decline from 1970 to 1981 for the average student in terms of the percentage of items answered correctly is from 32.5% to 31.7% on the Mathematics I subtest; from 38.3% to 34.2% on the Mathematics II subtest; from 49.4% to 43.4% on the English I subtest; from 55.3% to 47.0% on the English II subtest; from 44.7% to 39.0% on the Social Studies subtest; and from 41.7% to 38.7% on the Natural Science subtest.

Ability and performance

The declines in performance generally exist for gifted students (the upper 5% of the 11,466 students in 1970 and the 9,643 students in 1981) as well as for students at other levels of ability. Only on the first Mathematics subtest did the gifted perform at a level similar to the top 5% from 11 years earlier.

The lowest percentage of items answered correctly by the upper 5% of students in 1970 and 1981 was 65.0% and 64.4% on the Mathematics I subtest; 70.0% and 65.0% on the Mathematics II subtest; 77.4% and 68.6% on the English I subtest; 81.3% and 70.7% on the English II subtest; 77.3% and 69.7% on the Social Studies subtest; and 71.8% and 67.8% on the Natural Science subtest.

EXHIBIT 1
Decline in raw scores, 1970-1981



School characteristics and performance

School averages were formed on the basis of student scores in each school. The results show a small number of schools improving or declining significantly. Twenty-two of the 122 schools tested improved in performance, whereas 18 declined significantly on one or more of the subtests. (See Exhibit 2.)

Most frequently the changes represent performance on only one or two of the subtests. However, in three schools, performance was significantly higher for three or more subtests; one school improved in five out of the six subtests. Declines in three or more subtests occurred in three schools. One of those schools declined to a significant extent on five out of the six subtests.

The characteristics of schools in 1970 and 1981 available for this study included secondary enrollment, dropout rate, student-to-teacher ratio, and per-pupil expenditure. These features did not account for a sizable portion of the difference in scores from one year to the next in Mathematics, Social Studies, or Natural Science, but decreases in English performance from 1970 to 1981 tended to occur where there were increases in per-pupil expenditures.

Although the characteristics studied do not account for a large proportion of the performance differences, this does not suggest that school characteristics are not part of the explanation for declining scores. State office information collection in the past did not allow course offerings, course content, course enrollment, teaching methods, or other aspects of the school setting to be included in the analysis.

Student characteristics and performance

In addition to the information about the features of schools that was available for the analysis of both the 1970 and the 1981 results, information about family characteristics and student motivation was gathered as part of the 1981 administration of the Decade Study battery. Together these variables help to account for between 40% and 50% of the differences in scores in 1981.

Family background information included the level of parental education, family size, and student communication with parents about schoolwork. The information about student motivation included questions about self-assessment of performance, ease in taking tests, and the student's perceived value of achievement.

There are differences in the relationship of these three types of information to student performance on each of the subtests. (See Exhibit 3.)

The analysis clearly revealed that school context and family background had their strongest effects on performance on English I, English II, and Social Studies. Student motivation was most influential for Mathematics I and Mathematics II. In mathematics, student motivation has greater impact than the effect of either school context or family background. Performance in Natural Science in 1981 was affected in roughly equal measure by family background and student motivation; less influence was due to school context. Details of these results are in Appendix A.

The nature of the items constituting the three types of features may influence these results. The strong relationship of motivation to mathematics may reflect a number of motivation questions that

EXHIBIT 2

Number of schools where performance changed significantly, 1970-1981

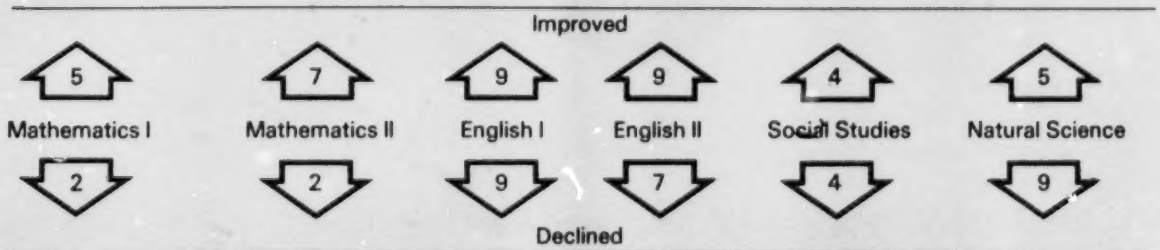


EXHIBIT 3
Influences on subtest performance in 1981

	Social Studies	English I	English II	Natural Science	Mathematics I	Mathematics II
School →	X	X	X			
Family →	X	X	X	X		
Motivation →				X	X	X

specifically mention mathematics. Family influences appear to relate to verbally oriented areas such as English and Social Studies. Students who talk at home with well-educated parents may have an advantage in learning about other cultures and correct language use.

Effects of environment and motivation

The school, family, and motivation features grouped together for analysis of performance were also examined as individual conditions that could relate to student achievement. Specific characteristics of these three elements are related to student achievement. Some relate to higher performance, while others relate to lower performance on the Decade Study subtests in 1981.

The aspects of school context—secondary enrollment, student-to-teacher ratio, dropout rate, and per-pupil expenditure—all have particular relationships to student performance. Both secondary school enrollment and dropout rate are consistently related to student achievement. In this sample of schools, students from schools with more than the sample average of 435 students performed significantly higher than students from smaller schools. In respect to dropout rate, schools with less than the 4% sample average have significantly higher achievement. For the final two aspects of context, student-to-teacher ratio and per-pupil expenditure, the influence is not consistent. For example, in terms of the student-to-teacher ratio; higher achievement in Social Studies and English is associated with schools with a ratio smaller than the 14.8 to 1 sample average, while the reverse is found for the Mathematics I subtest.

Family conditions also are related to student achievement. Students who talk with their parents about schoolwork perform better than their peers in English, Social Studies, and Natural Science. The amount of communication is clearly one of the most significant positive contributions of the family to a student's education. The education of the parents, both father and mother, is positively related to high achievement in Mathematics and Social Studies.

Differences in age and sex are factors in test results. Students 17 or older had higher achievement than younger students on the second part of the English subtest. Males scored higher in Natural Science and Social Studies than females, while females scored higher on the English II subtest.

In terms of the motivational information used in the study, the most positive predictor of student achievement was self-appraisal of the performance students expected on the Mathematics subtests. Students performed closely to their own estimates of ability. A second important piece of motivational information is the number of mathematics courses taken. This information indicates what has been called intrinsic interest, thirst for knowledge, or continuing motivation. The more mathematics courses the students take, the higher their achievement in both Mathematics and Natural Science.

Discussion

Public interest in the level of student performance is periodically fueled by reports of declining achievement test scores. Often those reports are

based upon tests that reflect only a small proportion of students in Illinois. The Decade Study has avoided that limitation by using a more representative population of Illinois students. Consequently, the Decade Study has allowed us to evaluate the outcomes of schooling during the junior year of high school by comparing students of a decade ago with contemporary students.

The results of the Decade Study indicate that the performance of high school juniors was significantly lower in 1981 than it was in 1970. Indeed, the decline was general in all subject areas tested and for all ability levels of students, except the top 5% of the students taking one of the Mathematics subtests. The decline in student achievement was not related to changes from 1970 to 1981 in the enrollment, per-pupil expenditure, student-to-teacher ratio, or dropout rate in schools. The results aggregated for individual schools showed that the majority of schools did not change significantly in average performance from one test administration to the next. However, 22 schools did perform significantly better and 18 performed significantly worse than in 1970.

A profile of characteristics related to student achievement in 1981 can be given for the features of school context, family characteristics, and student motivational factors collected with the most recent administration of the test battery. Features related to school context were most strongly related to performance on the English and Social Studies subtests. The school variables that most critically affected achievement were enrollment and dropout rate. Better performance in English and Social Studies was found in schools with enrollments larger than 435 students and lower than average dropout rates. Neither student-to-teacher ratio nor per-pupil expenditure was consistently related to outcomes. Three aspects of family life were also strongly related to achievement in 1981: father's education, mother's education, and talking to parents about school. Overall, the greatest influence of family on achievement was, like school conditions, upon the students' verbal skills on the English and Social Studies subtests. In terms of motivation, three features were strongly related to the 1981 student performance: the students' estimate of success on the Mathematics subtests, the number of mathematics courses taken by students, and students' belief in their own abilities and efforts to perform well in school.

Some of these features were expected to be important because of the work already done by researchers in education. Other features were confirmed because of the type of large-scale data collection undertaken for the first time in Illinois. The Decade Study shows that as researchers examine the issue of how to identify successful schools or how to characterize successful students, their work should take into account school, family, and motivation. Persons seeking to improve the educational process will also have to consider a similar scope of conditions.

Plans for school improvement often focus on curricular offerings or course requirements. An intensive case study of the curriculum and other variables in the schools in which test performance significantly increased or decreased could provide additional explanatory information about the results. The Decade Study does not discount the impact of curriculum, but does suggest that other conditions are vital for improved test results. Family conditions represented by level of parental education (reflecting aspirations, wealth, and ability) are undoubtedly beyond the control of either educators or legislators. On the other hand, encouraging parents to discuss schoolwork with their children may be an important contribution to achievement. This would support, in part, the initiative of the National Committee for Citizens in Education in 1982 that suggested that parental interest in schooling would positively facilitate performance. The motivation of a student relates directly to whether a student will deliver extra effort to complete a task well or to obtain more knowledge in a subject matter area. The Decade Study also dramatically highlights the role of motivation. Although student motivation is often discussed by educators, it is less often a part of school improvement efforts. The best intentions of parties interested in improving student performance on outcome measures will go awry without significant consideration of student motivation.

The Decade Study sheds light on some unique facets of Illinois education. Thoughtful consideration of this information can contribute to the improvement of education in Illinois.

APPENDIX A—THE DECADE STUDY TEST

This appendix is provided for persons interested in the nature of the test used in the study. Some may contend that the content and nature of the test influenced the outcomes. For example, test questions may have been more difficult at one time than at another because of curricular changes or perhaps because of differences in the information disseminated through the media. Although this study examined the curricular information available in the state office, characterization of the curriculum at the times of the test administration or during the educational careers of students was not possible. The following information, then, is provided as a starting point for those who wish to pursue the issue.

ORIGINS

During the late 1960s, the University of Florida contracted the Educational Testing Service (ETS) of Princeton, New Jersey, to develop a college entrance examination to be administered to high school seniors in Florida. On the basis of specifications from Florida, ETS developed a battery of instruments that were pilot-tested in 1967. The test was characterized at that time as difficult by the ETS development staff.

A few years later, in 1969, the Center for Instructional Research and Curriculum Evaluation (CIRCE) at the University of Illinois at Urbana-Champaign began to look for a new test to use in its testing service for Illinois high schools. A major portion of the Florida test was acquired to be used for high school juniors in Illinois. The test was first administered in Illinois in 1970 as part of the CIRCE service.

When the Illinois State Board of Education decided to implement a study of student achievement to compare past performance to contemporary performance, the test used by CIRCE was determined to provide the broadest baseline information readily available for the project. (See Exhibit A-1.) Permission to use the test was obtained from CIRCE, ETS, and the University of Florida.

EXHIBIT A-1
List of Subtests

Subtest	Number of Items
Natural Science	23
Social Studies	30
English Part I	35
English Part II	30
Mathematics Part I	36
Mathematics Part II	24
General Skills	10

TEST CONTENT

Although the names of the subtests in the battery are similar to school subjects, the general labels of Natural Science, Social Studies, and English all serve to cover more specific academic topics. For example, the Natural Science subtest items included physics, chemistry, and biology; the Social Studies subtest included world history, government, and United States history.

The Social Studies subtest contained eight items about government, five items about world history, three items on United States history, three items about economics, four items about sociology, three items about geography, and two items about general culture. The format and content of these items are quite varied. Sixteen of the items relate to information presented in the test. Two relate to the interpretation of a cartoon, four to information in a graph, four to a schematic representation of a "national assembly," and four to a map of a portion of colonial Africa. In spite of the illustrations and readings, only four items were directly answerable with the information provided, whereas nine were answerable through inference. The 17 knowledge-based items in the Social Studies subtest required students to know about the terms "left" and "right" when applied to European political party labels after World War I, the political meaning of "radical," general biographical knowledge of Muhammad and features of Islam, the Tennessee Valley Authority, and the political geography of colonial East Africa.

Two English subtests (65 items) dealt with what are generally called editing skills. Although both of the subtests included some similar content, performance on each of the sections differed slightly. The ETS description indicated that six items treated wording and expression, eight dealt with idioms; eight were about parallelism; twelve dealt with modification; six dealt with logic and coherence; sixteen dealt with subject-verb agreement; and nine applied to pronoun use.

The two English usage subtests measure similar knowledge about correct grammar, but within different formats. On the English Part I subtest, students were required to read through a sentence to find errors in any of the underlined parts. For example:

He works every day so that he
A B

would become

financially independent
C

in his old age. No error.
D E

(The correct answer is "A.")

Most of the students who failed to answer these types of questions correctly responded "E" or "No error." None of the other response alternatives were chosen to any substantial degree. This is a typical pattern for many of the items in Part I.

On the English Part II subtests, students were required to demonstrate essentially the same knowledge about correct grammar as on Part I, but were required to correct the underlined section of each sentence. An example of this second format using the same content as in the previous example follows:

He works every day so that he would become financially independent in his old age.

(A) He works every day so that he would become

(B) He worked every day so that he would become

(C) He worked every day in order that he would become

(D) Working every day, so he would become

(E) He had worked every day, becoming

(The correct answer is "B".)

The Mathematics subtests included 60 items representing arithmetic (7 items), algebra (18 items), geometry (12 items), definitions (8 items), set theory (4 items), graphs (6 items), and other topics (5 items). The presentation of the mathematics questions included the workbook and story problem styles with multiple-choice answers from which to choose. Seven of the 60 items were story problems. The terminology of mathematics plays an important role in understanding 31 of the questions. Such mathematics-oriented vocabulary and the language of the items included "congruent sectors," "isosceles triangle," "scientific notation," "intersecting planes," "fourth-degree polynomial," "multiplicative inverse," "associative law of addition," "irrational number," and "base 10."

The Natural Science subtest contained 23 items covering physics (10 items), biology (7 items), and chemistry (6 items). The natural science items included 11 items that depended on reading ability. Five of the reading items could be answered directly on the basis of information in the passage, while 6 others could be answered through inference from information given in the text. The remaining 12 items required the student to be familiar with specific knowledge to answer the question. Reading topics included types of parasites, the Bunsen burner, and Max Planck's theories about quanta. Specific knowledge items included the definition of the "vector sum" of forces, the nature of transmission of yellow fever, a product of incomplete combustion, an example of electromagnetic radiation, the general principle of the operation of an electron microscope, and the definition of an empirical law.

The 1981 test had a ten-item subtest labeled as "General Skills," which did not appear in the 1970 test. That section included items from the Illinois Inventory of Educational Progress (IIEP), the state assessment program. This section contained mathematics and reading items of moderate difficulty.

TEST CHARACTERISTICS

A number of technical characteristics of the battery used in the Decade Study were examined. Factor analysis was used to examine the structure of the test on the basis of 1981 student performance. The 1981 data were also examined through a three-parameter logistic program to identify a number of item characteristics in addition to subtest difficulty levels. Subtest reliabilities were examined using split-half techniques.

Factors

Results of the alpha-factoring approach indicated that one factor accounted for over 50% of the total test variance. This factor included a number of items from the English usage tests. The first four factors in order of strength were English usage, mathematical reasoning and definitions, social studies and science reading, and English grammar.

Difficulty

The beta values from the logistic analysis show both that the Decade Study battery was a difficult test as a whole and that some subtests are more difficult than others. In the following list of values, +3.00 is difficult and -3.00 is easy. The General Skills subtest represented the set of 10 anchor items from the IIEP that were included to determine the generalizability of sample results to statewide dimensions.

EXHIBIT A-2
Subtest difficulty

Subtest	Beta value
Mathematics I	2.00
Mathematics II	1.51
Social Studies	1.36
Natural Science	1.35
English I	1.18
English II	.85
General Skills	.18

Another perspective about the difficulty of the battery is obtained by examining the formulas which show relationship between 1970 and 1981 scores. The extent of the decrements between 1970 and 1981 is expressed in the following weighting formulas:

Social Studies, 1970	=	1.13 (1981)	+	.22
Natural Science, 1970	=	1.04 (1981)	+	.34
English I, 1970	=	1.04 (1981)	+	1.41
English II, 1970	=	1.02 (1981)	+	2.17
Mathematics I, 1970	=	1.02 (1981)	+	.13
Mathematics II, 1970	=	1.06 (1981)	+	.50

Using the formula for Social Studies, for example, shows that a score of 17 in 1970 would have been 15 in 1981.

Reliabilities

The internal consistency of the subtests on the 1981 administration was slightly lower than is usually obtained in standardized testing. Reliabilities ranged from .63 to .81 with the Kuder-Richardson formulas 20 and 21. (See Exhibit A-3.)

Reliabilities were undoubtedly low on the general skills materials because the general skills instrument contained only ten items, and reliabilities generally improve with length. For the other subtests, the number of students operating at a near-chance level could be a contributing factor.

Performance

Results of performance on the Decade Study battery were presented as part of an Illinois State Board of Education report entitled *Student Achievement in Illinois: An Analysis of Student Progress,* November 1982. The Exhibits A-4 through A-6 present alternative formats of the results.

EXHIBIT A-3
Subtest reliabilities

Subtest	KR 20	KR 21
Social Studies	.75	.72
English Part I	.78	.73
English Part II	.80	.76
Mathematics Part I	.81	.80
Mathematics Part II	.71	.68
Natural Science	.66	.63
General Skills	.72	.66

EXHIBIT A-4

Raw score results for all students

Subtest	Number of test items	1970 mean	1970 standard deviations	1981 mean	1981 standard deviations	Difference between means
Mathematics I	36	11.7	5.9	11.4	5.9	- .3
Mathematics II	24	9.2	4.2	8.2	3.9	-1.0
English I	35	17.5	5.7	15.2	5.5	-2.1
English II	30	16.6	5.2	14.1	5.1	-2.5
Social Studies	30	13.4	5.5	11.7	4.9	-1.7
Natural Science	23	9.6	3.8	8.9	3.7	- .7

EXHIBIT A-5

Raw scores results for groups of students

	Number of Items	Upper 5%	Upper 25%	Upper 50%	Upper 75%
Mathematics I, 1970	36	23.4	15.2	10.5	7.3
1981		23.2	14.5	10.0	7.1
Mathematics II, 1970	24	16.8	12.0	8.7	6.1
1981		15.6	10.5	7.6	5.3
English I, 1970	35	27.1	21.3	17.1	13.0
1981		24.0	17.9	14.8	11.2
English II, 1970	30	24.4	20.4	17.0	13.1
1981		21.2	14.3	14.3	10.2
Social Studies, 1970	30	23.2	17.3	12.9	9.1
1981		20.9	14.7	11.0	8.1
Natural Science, 1970	23	16.5	12.2	9.3	6.8
1981		15.6	11.4	8.6	6.2

EXHIBIT A-6

Raw score results: school averages, based on 122 schools

Subtest	Number of test items	1970 mean	1970 standard deviations	1981 mean	1981 standard deviations	Difference between means
Mathematics I	36	11.8	1.6	11.1	1.5	- .7
Mathematics II	24	9.0	1.0	8.0	.9	-1.0
English I	35	17.4	1.3	15.3	1.5	-2.1
English II	30	16.6	1.2	13.0	1.3	-3.6
Social Studies	30	13.3	1.4	11.7	1.2	-1.6
Natural Science	23	9.9	1.1	7.9	.8	-2.0

APPENDIX B—DESIGN AND ANALYSIS

Additional information about the design and analyses of the Decade Study is given here. Although it is not anticipated that the study will be replicated, some of the specifications below support the claim that the results generally represent the condition of education in Illinois.

Purpose

The purposes of the Decade Study were to determine (1) how well students performed in 1981 compared to 1970 on the same test battery, and (2) which of the available variables characterizing student, home, and school were related to those results.

Original Administration of the Test

From the late 1940s until 1976, the Center for Instructional Research and Curriculum Evaluation at the University of Illinois, Urbana-Champaign, provided a testing service for high schools in the state. Participation in the program was self-selected by school administrators.

In 1970, 307 of the 586 public high schools in Illinois used the test for approximately 34,000 juniors in the fall of that year. Testing was implemented locally in two or three sessions over one or two days. Testing generally occurred in October and November. Schools received student scores and school level percentile norms as the report of results.

Comparative Sample

The Illinois State Board of Education obtained the list of schools that participated in the 1970 testing program. A minimum sample of 120 schools was needed. One hundred thirty schools were randomly selected from the original list. Five were eliminated due to their consolidation with other schools or their choice not to participate. Three schools did not administer the test as had been expected. The reasons given for nonparticipation by the

EXHIBIT B-1
Characteristics of schools

		1970	1981
Percentage of urban population based on census	Range	9-94.9	0-98.6
	Average	17.4	19.4
Dropout rate	Range	0-37%	0-10%
	Average	5%	4%
Enrollment	Range	67-4,108	64-3,681
	Average	433.0	435.3
Student-to-teacher ratio	Range	8.4-25.8	7.9-24.4
	Average	18.4	14.8
Per-pupil expenditure	Range	$611.99-$1,993.05	$1,509.47-$4,582.77
	Average	$1,026.54	$2,157.90
Number of students tested in sample		11,466	9,693

majority of the dropouts was that the three-hour administration time would not fit into their November school schedule. The final sample consisted of 122 schools.

The schools were spread geographically and were diverse in size. The data in Exhibit B-1 characterize the schools at the times of the comparison.

Analysis

Both descriptive and inferential statistics were used to analyze the data used in the Decade Study. The analyses included significance tests for differences, discriminant analysis, and standard multiple regression.

APPENDIX C — THE PROSPECT OF COMPARATIVE STUDIES AT LOCAL EDUCATIONAL AGENCIES

Although comparisons of student achievement such as the one reported in this document have been conducted from time to time on a large scale, it may well be that the most appropriate level of implementation is at the school-district level. Statewide reports include large numbers of students and can claim the weight and breadth of the population involved as an advantage, but many challenges to such a study can be resolved only on a district-by-district basis. These challenges include:

- Does the test match past and present curricula?
- Was the match with the curriculum better at one time than the other?
- What proportions of the population enroll in courses where the tested content would be taught?
- Has the population attending the school changed?

With periodic comparisons at the local level, differences, changes, and characteristics can be tracked much more precisely than at the state level.

Such comparisons not only should include a review of the test results, which many districts are likely to do, but should attend to the conditions of education that are likely to influence performance. Some of the types of collateral data collected for this statewide effort would be useful at the local level—motivation, curricular exposure, or family background. Districts could add pedagogical practices, district demographics, course content, and cocurricular opportunities such as science clubs or mathematics competition.

The following list can serve as a guide for school districts interested in conducting their own comparative study.

COMPARATIVE STUDY GUIDE

1. Comparisons should be made for all students at a grade level.
   - A sample including all students capable of taking the test is best.
   - Individual students should not be systematically excluded.
   - Individual students should not be randomly excluded.
   - Illness or absences are acceptable omissions.
2. Tests used in a comparison should be the same or an alternate version of the same test.
   - If not the same, tests must be of comparable difficulty and statistically equatable.
   - If not the same, tests must be designed to be administered within a three-week range of time at the same time of the year.
3. Tests used in a comparison should be administered at the same time of the year within a three-week period.
4. The same metric must be used in the comparison; grade-equivalent scores must not be used.
5. Scores must be compared within curriculum areas.
6. Collateral characteristics of setting, classroom practices, students, or home should be collected so that the information represents the same definition at both times the study is conductd.
   - Student-level information can be collected in different ways—from school records or from the student—but should be compared if the collection method is the same or the result is verifiably the same.
   - To be of use, classroom-level, grade-level, or school-level information must become a part of the record on each student in the study.
   - Family information should be collected in the most reliable manner. Younger students may not be able to report some types of information about their families.
   - Information concerning personal attitudes, student motivation, and values should be considered confidential and secure.
7. Statistical comparisons should be made by standardizing each student score against the mean of each particular year and then comparing standardized scores from year to year.
8. Comparisons of standardized scores can be based on the rule

that a 1-1/2 standard unit difference is significant.

9. Achievement and collateral information can be compared using standard multiple regression techniques.

APPENDIX D—HISTORICAL CONTEXT

Any comparison of educational conditions at two different times must take differences in the context of the enterprise into account. The differences in schools over 11 years could very well contribute to differences in the performance outcomes on tests. At a minimum, a history of the educational context in 1970 compared to 1981 could be reviewed for potential influences on schools. Even that may not be complete enough, however. The educational experience of the class of 1982 was just beginning when the class of 1971 took the CIRCE battery in the fall of 1970. Similarly, the educational experience of the class of 1971 began at the end of the 1950s. In this sense, the Decade Study compares two educational generations.

This period included the beginning of many major programs of federal support for education. The National Defense Education Act was promulgated as one response to the Russian launch of Sputnik. Programs for academically superior students appeared to be necessary to meet the Soviet lead. By the late 1960s other concerns were targeted. Compensatory education—education designed to overcome the deficits of the "educationally disadvantaged"—was initiated in the early 1970s as Title I of the Elementary and Secondary Education Act. Other special concerns brought before educators included environmental education, drug education, dropout prevention, education for the handicapped, education for multi-language students, and desegregation. With the election of President Reagan, federal policy became to limit federal initiatives in education.

In Illinois the era included school consolidation; legislation parallel to federal legislation in compensatory, bilingual, and handicapped education; legislation leading the nation in gifted education; and legislation promoting reform. In addition, the Illinois Board of Education initiated efforts to promote long-range school planning and review, school review by state office staff, and approval of teacher education programs.

At the school-district level, there were pressures by federal and state programs and critics. Schools initiated consolidation efforts, established cooperatives for education of the handicapped, implemented federal and state legislation, engaged in writing measurable objectives for school plans, and often attempted to pass referenda in the face of public opposition. Local educators faced contrasting circumstances during these 22 years. Conditions changed from concerns about building enough classrooms for baby boom children to closing buildings in the era of declining enrollments; from teacher shortages to a surfeit of teachers seeking jobs, and from emphasis on advanced programs to an emphasis on basics.

The responses of schools to these conditions form part of the background related to student performance on tests. Examination of the impact of changing conditions has not been undertaken in this study, but it seems likely that at least a portion of the differences in student performance is attributable to the differences between a Sputnik generation compared to the following generation educated when other interests and concerns were prominent.

Illinois
State Board of
Education

100 North First Street
Springfield, Illinois 62777

Walter W. Naumer, Jr., Chairman
Illinois State Board of Education

Donald G. Gill
State Superintendent of Education

EDUCATION IS EVERYONE'S FUTURE

Bulk Rate
U. S. POSTAGE
PAID
Permit No. 805
Springfield, IL

An Equal Opportunity/Affirmative Action Employer
Printed by the Authority of the State of Illinois
October 1983 2M 4-346B-41 No. 302